

name of *cisternae* has been recently proposed (Palade & Porter, 1954). Because such elements were not originally described in cultured cells examined *in toto* (Porter, 1953), spread specimens were reexamined (Palade & Porter, 1954) and in many cases the endoplasmic reticulum was found to consist mainly of large, flat cisternae of irregular outline with only a few tubular and vesicular elements present. (Palade, 1956b, p. 89)

Just as he did in the case of mitochondria, Palade observed in his improved micrographs a new structure in the endoplasmic reticulum – he found that frequently the outer surface of the membranes of the endoplasmic reticulum were coated with fine granular material that at higher resolutions appeared as discrete structures ranging from 10 to 30 m μ in size.²⁸ Porter (1954), after arguing that the endoplasmic reticulum was the source of the basal staining and hence the basophilic component of the cytoplasm, concluded that the basophilia was due to these particles on the grounds that the basal staining was most prominent in tissue in which granules were attached to the endoplasmic reticulum. He further related the granules to a fraction with particles smaller than the microsomes isolated by Barnum and Huseby (1948) and to a fraction of particles of the same size as those on the endoplasmic reticulum that Petermann, Mizen, and Hamilton (1953) demonstrated to contain large amounts of RNA. Porter concluded by identifying similar particles in the nucleolus.

Dissenting Voices

As in the case of the mitochondrion, Sjöstrand criticized Porter and Palade's studies of the endoplasmic reticulum. Emphasizing the fact that in thin slices what appeared were pairs of membranes, Sjöstrand and Rhodin claimed that the ground cytoplasm was divided "into open compartments through well-defined intracellular double membranes" (1953, p. 428). The following year, in a paper with Hanzon, Sjöstrand expanded on his characterization of the intracellular cytoplasmic membranes, now identifying "'small opaque particles' attached to one side." (These are quite apparent in the micrographs they published – see Figure 6.10.) He further described,

The smooth surfaces of the intracellular cytoplasmic membranes face each other giving the impression of the membranes being arranged in pairs. They always

²⁸ Porter's initial response to these particles on parts of the endoplasmic reticulum was that they were likely artifacts due to damage caused by the electron beam. With a denigrating intent, he initially dubbed them *Palade particles*. (Interview with George Pappas, 23 October 1995, University of Illinois Chicago.)